

Suborbital Platforms as a Tool for a Symbiotic Relationship Between Scientists, Engineers, and Students

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Summary

Sounding rockets started in-situ space experimentation over 60 years ago with scientific experiments replacing warheads on captured V-2 German rockets. Prior to this, and still today, suborbital platforms such as airplanes and high-altitude balloons have provided advantageous remote sensing observations advancing many areas of Earth and Space science. There is still a place for first-rate science in both stand-alone missions as well as providing complimentary measurements to the larger orbital missions. Along with the aforementioned science, the cost effectiveness and development times provided by sub-orbital platforms allows for perfect hands-on and first rate educational opportunities for undergraduate and graduate students. This talk will give examples and discuss the mutually beneficial opportunities that scientists and students obtain in development of suborbital missions. Also discussed will be how the next generation of space vehicles should help eliminate the number one obstacle to these programs – launch opportunities.

Introduction

The suborbital program at NASA provides a unique niche in NASA science, engineering, and education. The three suborbital platforms: airplanes, high-altitude balloons, and sounding rockets have the primary goal of providing new science results, although usually with a single, very focused goal due to their obvious limitation in time, altitude, and funding. The secondary goal of these missions is to prove instrument science concepts and technology for future, more elaborate investigations that will reduce the risk of these heavy resources, more limited orbital opportunities. The tertiary goal of the suborbital platforms is to provide a unique, hands-on education for young scientists and engineers that compliment the formal education curriculum.

Science

A specific science goal is necessary for any successful proposal to be selected. Many specific examples will be presented here of

outstanding science results in all areas of NASA research. These examples will all be from the traditional NASA suborbital platforms. Audience input is encouraged for future science goals in these areas taking advantage of the next generation of commercial suborbital opportunities that will soon become available.

Concept Development

Suborbital platforms are also perfect for testing new instrument concepts. Lower costs allow scientists to develop more complex scientific instruments. A successful suborbital mission allows for risk mitigation to help ensure the success of future manifestations of the instrument on the more expensive, more time consuming orbital platforms with more complex science goals.

Education

The unstated goal of education of the next generation of scientists and engineers is a major component of suborbital programs. The low-cost of these programs requires students and early professionals to do a majority of the work. The short development time provides students with a more-complete picture of the entire mission process. Students are given mission critical responsibilities and lead many of the tasks. Mentors also benefit from this relationship as students bring new and innovative ideas, techniques, and technology to the table.

Conclusions

For the past 60+ years, science, technology, and education have all benefited from suborbital platforms. Throughout this presentation advice and examples describing how scientists and engineers of all experience levels work together to achieve first-rate science and to enhance the education of all involved. This presentation serves to begin an important community discussion, and hopefully will be a stimulus for future conversation and collaborations, on how the commercial suborbital program can help make these symbiotic opportunities more frequent.